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sample elementary cell is illustrated in FIG. 6. The OPV 4 provides a source of energy and the energy storage device 6 allows the satisfactory powering of the integrated circuit of the cell and of an eventual output transducer or communication device with the external world. Adequate energy storage capability may be provided by a relatively large organic capacitor or by a compatibly integratable thin film battery.

The integrated circuit entirely formed with OTFT, organic resistors and capacitors, manages the energy conversion and storage, and may include, in case of the sample cell considered, a pulse driving circuit 7 for the OLED 5, and even a crepuscular switch 8. Pulsed driving of the OLED may reduce consumption by more than 50%, for example.

A cross-sectional view of the integrated structures of basic integrated devices that form the functional cell circuit of FIG. 6 is shown in FIG. 7. The different shadings illustrate the boundaries of the regions/layers that form the passive and active components of the integrated circuit and of the powering and light emitting devices of the sample cell. The legend at the foot of the drawing gives the general characteristics of the materials of the different regions/layers. The On/Off crepuscular switch 8 may be implemented by an OTFT controlled by the voltage generated by the OPV, as illustrated in FIG. 7.

FIG. 8 is a fragmentary cross-sectional view showing the structure of the organic transistors (OTFT) of the integrated structure of FIG. 7. The integrated transistor structure comprises the conductive gate electrode layer 12 being, for example, gold, the high-k dielectric 13 layer being, for example, PMMA, the organic semiconductor layer 14 being, for example, P3HT (Poly(3-Hexylthiophene)), F8T2, PTAA, or pentacene. The organic semiconductor layer 14 embeds interleaved multi-fingers of source and drain electrodes 15 and 16 of the same organic conductor material with which the gate electrode 12 is made. The low-k dielectric material 17, which may be, for example, Polystyrene Polyimide (PI), isolates the integrated OTFT structure.

FIG. 9 is a fragmentary cross-sectional view of the organic light emitting diode (OLED) of the integrated structure of FIG. 7. The electrode layers 18 and 19 may be of the same conductive material as illustrated in the cross-sectional of the integrated structure of FIG. 7. The conductive anode layer 21 and the emissive cathode layer 20 may be chosen from the commercial family of MERCK's Livlux® products, for example.

FIGS. 10 and 11 are fragmentary cross-sectional views of alternative structures of the organic photovoltaic device (OPV) of the integrated structure of FIG. 7. The donor layer 22 may be tri[4-(2-thienyl)phenyl]amine or tris[4-(5-phenylthiophen-2-yl)phenyl]amine. The acceptor layer 23 may be fullerene, and the hetero-junction layer 24 may be SnPc: C₆₀.

FIG. 12 is a fragmentary cross section of a large size capacitor useful as energy storage element and usable in the integrated structure of FIG. 7. FIG. 13 is a fragmentary cross-sectional view of a thin film battery usable as an energy storage element in an integrated structure similar to the one depicted in FIG. 7. The encapsulating layer 17 may be PET/PEN, for example.

FIG. 14 is a fragmentary partially sectioned integrated structure of an all organic integrated sensor and/or actuator system in which functional circuitry is embedded in an all organic electromechanical transducer device (IP²C), as disclosed in Italian patent application no. VA2008A000062, the entire contents of which are herein incorporated by reference. As described in the above noted application, the

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electromechanical transducer device exploits the behavior of a flexible sensible ionomeric material sheet as an effective sensing or actuating member sandwiched between flexible organic electrodes when undergoing a deformation or being polarized at a certain drive voltage applied to counter electrodes of the device.

The integrated system may be replicated in each cell of the monolithically fabricated flexible multi-cell sheet of the present embodiments, eventually along with an OPV front element for recharging an embedded micro battery, to provide for different useful functionalities of the tailorable flexible multi-cell sheet. For example, the sheet may be useful as a pressure distribution mapping device over large surfaces, or as a light operated large area profile actuator.

FIG. 15 is a fragmentary simplified cross-sectional view of an integrated motion/pressure sensing device as disclosed and illustrated in FIG. 5 of Italian patent application no. VA2008A000062, that is also configured to be included in an elementary cell of the flexible multi-cell sheet of the present embodiments, eventually along with an OPV front element for recharging an embedded micro battery, to provide for yet different useful functionalities of the tailorable flexible multi-cell sheet.

That which is claimed:

1. A method of making an article comprising:

forming a flexible multi-layered sheet, comprising an organic polymer material, by at least

forming an array of at least one type of organic integrated circuit (IC) cells in side-by-side relation, with each organic IC cell comprising an organic base IC energy storage element, and front and rear common conducting layers on opposing sides of the organic base IC energy storage element, the front and rear common conducting layers being coupled in parallel with the organic base IC energy storage element and shared with other cells of the same type to define common power supply lines, the front common conducting layer comprising a conductive polymer perimeter strip carried along a perimeter of the organic IC cell to electrically couple adjacent ones of the organic IC cells, each organic IC cell further comprising an organic light emitting diode (OLED) and an organic photovoltaic device (OPV), the OLED being spaced from the conductive polymer perimeter strip by the OPV,

the array being formed to include a number of cells to be removable therefrom so that cells that remain after removing are operable irrespective of whether the removal occurred at an intercell boundary among the cells and so that each operable cell that remains is bordered by a plurality of operable cells after removing.

2. The method of claim 1, wherein forming the array comprises forming the array as a monolithic unit.

3. The method of claim 1, wherein forming the array comprises forming the array so the number of cells being removable is removable by cutting the flexible multi-layered sheet along at least one intercell boundary.

4. The method of claim 1, wherein forming the array comprises forming the array so the number of cells being removable is removable by cutting the flexible multi-layered sheet along straight lines.

5. The method of claim 4, wherein forming each organic IC cell further comprises forming a light sensitive switch to be coupled to the OPV.